Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

# General

## Title

Inpatient perinatal care: percent of live-born neonates less than 2,500 grams that have a temperature documented within the Golden Hour from birth to 60 minutes of age.

## Source(s)

CHIPRA Pediatric Quality Measures Program (PQMP) candidate measure submission form (CPCF): timely temperatures for all low birthweight neonates. Rockville (MD): Collaboration for Advancing Pediatric Quality Measures (CAPQuaM); 43 p.

# Measure Domain

## Primary Measure Domain

Clinical Quality Measures: Process

## Secondary Measure Domain

Does not apply to this measure

# Brief Abstract

## Description

This measure is used to assess the percent of live-born neonates less than 2,500 grams that have a temperature documented within the Golden Hour from birth to 60 minutes of age.

## Rationale

This measure addresses a key gap in inpatient perinatal care. Evidence that thermal management (such as hot water bottles and incubators) improves survival of newborn and premature infants exists from as early as the late 19th century (Garrison, 1923; Holt, 1902; Baker, 2000; Pierce, 1875; Currier, 1891; Fischer, 1915; Holt & Macintosh, 1940). Modern studies have confirmed and extended these findings, including potential methods to maintain temperature for infants in the delivery room (Silverman, Fertig, & Berger, 1958; Sinclair, 2007; Watkinson, 2006). Laptook et al. confirmed the association of temperature loss with poor outcomes in 5,277 infants, 401 to 1,499 grams, born at any of 15 academic medical centers participating in the National Institute of Child Health and Development (NICHD) Neonatal

Research Network (Laptook, Salhab, & Bhaskar, 2007). A formal item selection process looking at potential measures for infants under 1,500 grams identified neonatal temperature as an independent contributor to a composite quality of care measure (Profit et al., 2011).

Chart review data were collected from three diverse hospitals in New York City. All three hospitals had a range of birth weights and a range of temperatures. Temperature predicted in-hospital mortality after controlling for covariates. The relationship between temperature and survival is monotonic: an increase of each 1° Celsius up to 37° reduced odds of death by more than 35% in the model using a continuous variable (22% for 1° Fahrenheit). Defining hypothermia as admission temperature below 36.0 would estimate an increase in the risk of mortality by 27%, p=0.19.

The work confirmed findings in the literature that insurance status and race (Reynolds et al., 2009) are associated with outcomes. Anecdotal reports from among the participating hospitals confirm reports in the literature (Doyle & Bradshaw, 2012) that attention to thermal management can improve temperature outcomes. See the appendix of the original measure documentation for a more complete literature review.

A distinguished multidisciplinary panel of national experts that included neonatologists, family physician, nurses, and a pediatric hospitalist articulated that it was a fundamental principle that all low birth weight infants need to have a timely temperature taken, whether sick or healthy, admitted to a regular nursery, or to a special care nursery or NICU. "Timely" was considered to represent different values by different Expert Panelists, but in the end none felt it was excusable as a matter of neonatal safety that any low birth weight child would go their first hour without having a documented temperature.

A Vermont Oxford Network NICU team has migrated the term "The Golden Hour" from field trauma to neonatology to describe the first hour of life (Reynolds et al., 2009). Prevention of hypothermia was described as the cornerstone of Golden Hour activities and continues as such in more recent writings (Doyle & Bradshaw, 2012). Delay in taking temperatures until after one hour of life is a profound violation of fundamental concepts regarding the management of low birth weight newborns.

## Evidence for Rationale


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CHIPRA Pediatric Quality Measures Program (PQMP) candidate measure submission form (CPCF): timely temperatures for all low birthweight neonates. Rockville (MD): Collaboration for Advancing Pediatric Quality Measures (CAPQuaM); 43 p.

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## Primary Health Components

Inpatient perinatal care; temperature documentation; live-born low birthweight neonates; golden hour

## Denominator Description

Live-born neonates with birthweight of less than 2,500 grams (see the related "Denominator Inclusions/Exclusions" field)

## Numerator Description

Live-born neonates with a birthweight of less than 2,500 grams who have their temperature taken within the first 60 minutes of life (see the related "Numerator Inclusions/Exclusions" field)

# Evidence Supporting the Measure

## Type of Evidence Supporting the Criterion of Quality for the Measure

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

## Additional Information Supporting Need for the Measure

Evidence for Importance of the Measure to Medicaid and/or Children's Health Insurance Program (CHIP)
In New York State, about half of low birthweight (LBW) babies are insured by Medicaid. Hypothermia is not only associated with neonatal mortality, but there is evidence that intraventricular hemorrhage (IVH) can also be a consequence of hypothermia. IVH is a significant cause of disability, developmental delay, and, when serious, is a common cause for LBW infants to develop into children with special health care needs. This has broad impact on Medicaid, Medicaid expenses, and early intervention services, including Early and Periodic Screening, Diagnostic and Treatment (EPSDT) services. Hypothermia, through death and disability, may have a long tail that impacts families and programs associated with Medicaid. Furthermore, the Medicaid population is disproportionately black and in the testing data, black infants were disproportionately hypothermic.

Research Evidence
Key findings from a study of 7,553 neonates (from 61 nurseries) in New York State are the following: temperature was variable within weight categories, and blacks were disproportionately cool compared with Hispanic or non-Hispanic others, who were disproportionately cool compared with non-Hispanic whites, whether or not they were stratified by birthweight category. Deaths were disproportionate among those who were cool, in a graded fashion.

The distribution of mean temperature by nursery ranged from 35.7 to 38.2, with a median of 36.3, a standard error of 0.36, and an interquartile range of 0.4. Twenty-five percent of these nurseries had a mean temperature below 36.1. It is concluded that temperatures do vary across nurseries, further reinforcing the sense that this topic is an important measure of performance.

Using the Mount Sinai Data Warehouse, which is linked to Mount Sinai's Epic electronic medical record, the developer looked at the time of the first recorded temperature for low birthweight newborns for a one-year period (446 infants for whom the time of the first temperature could be identified electronically) across the weight spectrum and found that on average there were several infants each month whose temperature-taking was delayed, and that these infants were across all weight categories. These data confirm that while infants generally have their temperature taken within 60 minutes, even at a teaching hospital with Level 4 care such as Mount Sinai (which has succeeded in raising admission temperatures for LBW infants because of sustained attention to the issue), it is not universal.

## Evidence for Additional Information Supporting Need for the Measure

CHIPRA Pediatric Quality Measures Program (PQMP) candidate measure submission form (CPCF): timely temperatures for all low birthweight neonates. Rockville (MD): Collaboration for Advancing Pediatric Quality Measures (CAPQuaM); 43 p.

## Extent of Measure Testing

Reliability
The basis for the scientific soundness of this measure lies in the use of a hybrid of administrative/encounter and medical records data. Though they have their limitations, these data types have been shown in multiple studies to be a reliable source of information for population level quality measurement. One such study found that quality measures that could be calculated using administrative data showed higher rates of performance than indicated by a review of the medical record alone, and that claims data is more accurate for identifying services with a high likelihood of documentation due to reimbursement.

A feasibility study of diverse hospitals from across the country and in different stages of electronic medical record (EMR) development was conducted. The developer's feasibility study was designed to determine the ability and ease of collecting related data. The results from this study show that date and time are self-evident and that there is mild but manageable variation in how time is reported. This limited variation will not impair the calculation of a neonate's age or the relationship of the time of

measurement to the time of birth or to the time of arrival to the neonatal intensive-care unit (NICU), as may be required in the measure set. Twelve of 15 respondents were clear that the data would be in the infant record and three others thought it would be in the mother's chart. Nine of 10 who responded to the question indicated the data would be available in the electronic medical record, while one thought that it was more likely in the paper record. None thought the data would be very difficult to obtain.

In the team's work studying processes and outcomes of neonatal care in three New York City hospitals, they found that chart abstractors could be readily trained to collect valid and reliable data regarding the thermal management of children (and other processes of care) using a simple portable electronic data abstraction tool (Virnig & McBean, 2001; Rubio et al., 2003).

Validity

The validity of the measure stems not only from the use of a formal process that was highly engaged with stakeholders and the literature in order to generate potential measures, but from empirical data analysis of both the Mount Sinai Data Warehouse and the New York State Department of Health Inpatient Neonatal database which has data on virtually all children admitted to Level 2 or higher nurseries in the state.

Testing (using Mount Sinai data) of International Classification of Diseases, Ninth Revision (ICD-9) codes as a way to identify LBW infants found that 99 infants out of 677 who were identified with the ICD-9 specifications listed in Table 1, Section I of the original measure documentation, had birth weights of over 2,500. The ICD-9 codes for this cohort that were 2,500 grams or above is listed in Table 2.

Of the 99 infants, 5 had recorded birth weights of 2,500 grams, consistent with the ICD-9 codes used. The developer has indicated in the specifications that the various ICD-9 codes, such as 764.00, 764.10, and 765.10 that represent poor fetal growth without a specified weight need to have their eligibility for the measure confirmed with an actual birthweight.

The key constructs underlying the measures are:

> Date and time of birth, date and time of arrival to the Level 2 or higher nursery, and time when the first temperature was taken.

Testing with data from the New York State Neonatal database supports various aspects of this measure. The data include reports from 20 Level 2 nurseries, 27 Level 3 nurseries, and 14 Regional Perinatal Centers that contributed 20 or more infants for the reporting year assessed. Included in the data are all inborn infants from these hospitals with a birthweight of 400 to 2,499 grams whose admission temperature was 29° Celsius or higher. Excluded were those with anencephaly or those who expired within 48 hours without receiving respiratory support beyond oxygen in the NICU. N=7,553. The number of infants ranged from 21 to 370 per hospital and 86.7% were admitted to Level 3 or higher hospitals.

The developer investigated time of first temperature among infants admitted to the neonatal intensive care unit within 24 hours of birth. Overall, it was found that temperatures taken after 15 minutes of arrival were significantly more likely to be euthermic and less likely to be cool or cold, consistent with expected findings.

Data analysis confirms that there is variability in the time at which temperatures are taken. Statewide, 86.8% of LBW infants have their temperature taken within 15 minutes of arrival to the nursery. Age of neonate at time that the first temperature was taken was also investigated. It was found that 10.8% of LBW infants (n=815) did not have documentation of a temperature within the first hour of life. The systematic variation—including the racial differences noted above—and the apparent structural variation seen across the Level 2, 3, and 4 nurseries reinforce the decision to prioritize these proposed measures of timing as important process of care measures, with failure of the 60 minute measure representing a meaningful failure that jeopardizes patient safety. Data regarding age of neonate and temperature can be seen in Table 3 of the original measure documentation.

Temperatures measured after 60 minutes of life were higher than those measured within the first hour (p less than .0001). The findings have important implications. The temperature difference reminds [us] that

temperature in LBW infants is largely a factor of environment, and that the potentially chaotic environment surrounding delivery and transport immediately following delivery is very different from the potentially more controlled environment of the nursery an hour or more after birth. So the earlier and later temperatures are actually measuring different constructs. Failure to measure a timely temperature after birth forgoes the opportunity to identify and manage early cold stress. Further, if temperature is a quality indicator as proposed, the higher later temperatures may become an incentive to not enter early cool temperatures into the permanent medical record.

The developer also employed a multitude of experts and diverse stakeholders—clinicians, scientists, payers, purchasers, and consumers—as another means of establishing validity and believes this to be central to validity in the context of measuring quality amidst uncertainty. They obtained feedback on the face validity of the constructs, the development of the Boundary Guidelines, and the measure's testing. The use of Expert Panels has been demonstrated to be useful in measure development and evaluation, and practitioners have been identified as a resource for researchers in developing and revising measures, since they are on the frontlines working with the populations who often become research participants. Involving practitioners can assist researchers in the creation of measures that are appropriate and easily administered.

Throughout development, the Collaboration for Advancing Pediatric Quality Measures (CAPQuaM) brought together stakeholders to ensure their iterative engagement in advancing quality measures that are understandable, salient and actionable. CAPQuaM employed a 360° method, designed to involve key stakeholders in meaningful ways. The development process for this measure cultivated formal input from:

Medical literature (both peer reviewed and gray, including state websites);
Relevant clinicians;
Organizational stakeholders (consortium partners, as well as advisory board members, see below);
Multidisciplinary, geographically diverse Expert Panel including clinicians and academicians; and
CAPQuaM's scientific team.

Clinical criteria regarding reporting approaches, including consideration of inclusion and exclusion criteria, the value of temperature measurement, and specific and meaningful temperature cutoffs were developed using a modified version of the RAND/University of California, Los Angeles (UCLA) modified Delphi panels. CAPQuaM sought recommendations from major clinical societies and other stakeholders to identify academic and clinician Expert Panel participants with a variety of backgrounds, clinical and regional settings, and expertise. The product of this process was participation by a broad group of experts in the development of clinically detailed scenarios leading to the measures.

The route to measure specification included development of relevant scenarios and issues for formal processing by an Expert Panel who participated in a two-round RAND/UCLA modified Delphi panel that culminated in a day-long in-person meeting hosted at the Joint Commission and moderated by a pediatrician and an obstetrician-gynecologist. The output from that panel meeting was summarized in the form of a Boundary Guideline that was then used to guide the measure specification and prioritization.

The developer's feasibility work indicates that the time the temperature is assessed, rather than simply the time that it is recorded, is documented in the medical record, generally an electronic medical record (EMR). This is a critical aspect of the validity of time data.

## Evidence for Extent of Measure Testing

CHIPRA Pediatric Quality Measures Program (PQMP) candidate measure submission form (CPCF): timely temperatures for all low birthweight neonates. Rockville (MD): Collaboration for Advancing Pediatric Quality Measures (CAPQuaM); 43 p.

Rubio D, Berg-Weger M, Tebb SS, Lee ES, Rauch S. Objectifying content validity: conducting a content validity study in social work research. Soc Work Res. 2003;27(2):94-104.

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# State of Use of the Measure

## State of Use

Current routine use

## Current Use

not defined yet

# Application of the Measure in its Current Use

## Measurement Setting

Hospital Inpatient

Other

## Professionals Involved in Delivery of Health Services

not defined yet

## Least Aggregated Level of Services Delivery Addressed

Clinical Practice or Public Health Sites

## Statement of Acceptable Minimum Sample Size

Unspecified

## Target Population Age

Newborn

## Target Population Gender

Either male or female

# National Strategy for Quality Improvement in Health Care

## National Quality Strategy Aim

Better Care

### National Quality Strategy Priority

Health and Well-being of Communities
Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

## Institute of Medicine (IOM) National Health Care Quality Report Categories

### IOM Care Need

Getting Better

Staying Healthy

### IOM Domain

Effectiveness

Safety

Timeliness

## Data Collection for the Measure

### Case Finding Period

Unspecified

### Denominator Sampling Frame

Patients associated with provider

### Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

### Denominator Time Window

not defined yet

### Denominator Inclusions/Exclusions

Inclusions
Live-born neonates with birthweight of less than 2,500 grams (as identified from either the medical record or by International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] principal or other diagnosis codes)

Note: For codes 76400, 76410, 76420, 76490, 76500, birthweights should be verified from the medical record prior to including in measure. Refer to the original measure documentation for administrative codes.

Exclusions

Neonates who do not survive until the time limit of the measure (60 minutes after birth)
Neonates not born in hospital/medical care setting
Neonates with anencephaly ICD-9-CM 740
Neonates with Comfort care (requires all of the features below): Died within 48 hours of birth; AND Received no respiratory support after arrival to the Level 2 or higher nursery other than blow by oxygen (i.e., did not receive continuous positive airway pressure [CPAP], intubation, or cardiopulmonary resuscitation [CPR] after arrival at Level 2 or higher nursery)

## Exclusions/Exceptions

not defined yet

## Numerator Inclusions/Exclusions

Inclusions
Live-born neonates with a birthweight of less than 2,500 grams (as identified by International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] Principal or Other Diagnosis Codes) who have their temperature taken within the first 60 minutes of life

Note: Refer to Table 1 in the original measure documentation for ICD-9-CM Principal or Other Diagnosis Codes.

Exclusions
None

## Numerator Search Strategy

Institutionalization

## Data Source

Administrative clinical data

Electronic health/medical record

Paper medical record

## Type of Health State

Does not apply to this measure

## Instruments Used and/or Associated with the Measure

Unspecified

# Computation of the Measure

## Measure Specifies Disaggregation

Does not apply to this measure

## Scoring

Rate/Proportion

## Interpretation of Score

Desired value is a higher score

## Allowance for Patient or Population Factors

not defined yet

## Description of Allowance for Patient or Population Factors

General Data Elements for Stratification and Reporting:

- Birthweight
- 5 minute Apgar
- Race/ethnicity
- Insurance type (public, commercial, none, other)
- Benefit category (Health Maintenance Organization [HMO], Preferred Provider Organization [PPO], Medicaid Primary Care Management Plan, Fee for Service, Other)
- Mother's state and county of residence and or ZIP code
- Medicaid or Children's Health Insurance Program (CHIP) benefit/qualifying category
- Born inside or outside of a medical facility
  - Location of birth
    - Operating Room (e.g., for Cesarean section or double set up delivery)
    - Birthing room (birthing room is referring to a birthing or delivery room on a labor and delivery suite that is not an operating room)
    - Other
  - Location of birth unavailable:
    - If delivery occurred by Cesarean section then put location of birth as operating room
    - If this was a twin or multiple gestation delivery put location of birth as operating room
    - Otherwise put location of birth as birthing room/delivery room

## Standard of Comparison

not defined yet

# Identifying Information

## Original Title

CAPQuaM PQMP PERINATAL I: timely temperatures for all low birthweight neonates.

## Measure Collection Name

Inpatient Perinatal Care

## Submitter

Collaboration for Advancing Pediatric Quality Measures - Health Care Quality Collaboration

## Developer

Collaboration for Advancing Pediatric Quality Measures - Health Care Quality Collaboration

## Funding Source(s)

Unspecified

## Composition of the Group that Developed the Measure

Unspecified

## Financial Disclosures/Other Potential Conflicts of Interest

Unspecified

## Adaptation

This measure was not adapted from another source.

## Date of Most Current Version in NQMC

2014 Aug

## Measure Maintenance

Unspecified

## Date of Next Anticipated Revision

Unspecified

## Measure Status

This is the current release of the measure.

## Measure Availability

Source available from the Collaboration for the Advancement of Pediatric Quality Measures (CAPQuaM) Web site .

For more information, contact Dr. Lawrence Kleinman, Director of Collaboration for Advancing Pediatric Quality Measures (CAPQuaM) at the Icahn School of Medicine at Mount Sinai, Department of Population Health and Policy at 1 Gustave L. Levy Place, Box 1077, New York, NY 10029; Phone: 212-659-9567; E-mail: Lawrence.Kleinman@mountsinai.org; Web site: www.capquam.org .

## NQMC Status

This NQMC summary was completed by ECRI Institute on July 14, 2015. The information was not verified by the measure developer.

## Copyright Statement



# Production

## Source(s)

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# Disclaimer

## NQMC Disclaimer

Readers with questions regarding measure content are directed to contact the measure developer.